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Low-Carbon Quick Wins: Integrating Short-Term Sustainable Transport Options in Climate Policy in Low-Income Countries

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Abstract: In low income countries (LICs) in Africa and Asia per capita transport greenhouse gas emissions are relatively low but are expected to grow. Therefore, a substantial reduction in projected increases is required to bring emissions in line with long-term global climate objectives. Literature on how LICs are integrating climate change mitigation and sustainable transport strategies is limited. Key drivers of transport policy include improving accessibility, congestion, air quality, energy security, with reducing greenhouse gas emissions being of lower priority. This paper assesses the current status, feasibility and potential of selected low-carbon transport measures with high sustainable development benefits that can be implemented in the short to medium term, so- called 'quick wins'. It examines to what extent ten such quick wins are integrated in climate change strategies in nine low- and middle-income countries in Africa and South Asia. The research method comprises expert interviews, an online questionnaire survey of experts and policymakers in the focus countries, and a review of literature and government plans. Results indicate that sustainable urban transport policies and measures are considered high priority, with vehicle-related measures such as fuel quality and fuel economy standards and electric two- and three-wheelers being of key relevance. In existing national climate change strategies, these quick wins are integrated to a certain extent; however, with better coordination between transport and energy and environment agencies such strategies can be improved. A general conclusion of this paper is that for LICs, quick wins can connect a 'top-down' climate perspective with a 'bottom-up' transport sector perspective. A knowledge gap exists as to the mitigation potential and sustainable development benefits of these quick wins in the local context of LICs.

Keywords: low-income countries; low-carbon transport; sustainable mobility; climate change strategies; transport policy; Paris Agreement

1. Introduction

Greenhouse gas (GHG) emissions from transport are rising faster than any other economic sector [1]. Under a business-as-usual (BAU) scenario, global transport GHG emissions are expected to increase from 8 to 16 billion tonnes (t) by 2050. This poses a significant challenge to achieving long-term objectives outlined in the United Nations Paris Agreement, which set out a global action plan to avoid dangerous climate change [2]. Limiting global warming to below 1.5 °C will require GHG emissions being reduced to 2 to 3 gigatonnes (Gt) by 2050 and to up to 6 Gt for a 2 °C scenario [3].

Per capita transport GHG emissions in low-income countries (LICs) are approximately 0.1 to 0.5 t compared to high-income countries (HICs) at 2 to 5 t. The contribution of LICs to total global transport

GHG emissions is 0.5% [4,5]. Rapid motorisation in LICs is expected to increase future transport GHG emissions which threaten the long-term global climate objective of 0.2 to 0.6 t per capita for transport (assuming 10 billion in 2050).

LICs recognise the need to reduce transport emissions as part of international commitments, but this is not the primary driver behind many transport policy interventions. Other development concerns are higher on the political agenda such as improving urban mobility and accessibility, rural connectivity, efficient logistics, and sometimes energy security (i.e., reducing of oil imports) and health (e.g., improving in air quality and physical activity levels). For example, in Accra (Ghana) climate change was not prioritised in sustainable urban transport project assessment although air and noise pollution were included [6]. In Dhaka (Bangladesh) environmental criteria for sustainable urban transport included noise and air pollution but GHG emissions were not explicitly stated [7]. Within this context, low-carbon transport (LCT) can be seen as a co-benefit of sustainable transport policies (Figure 1).

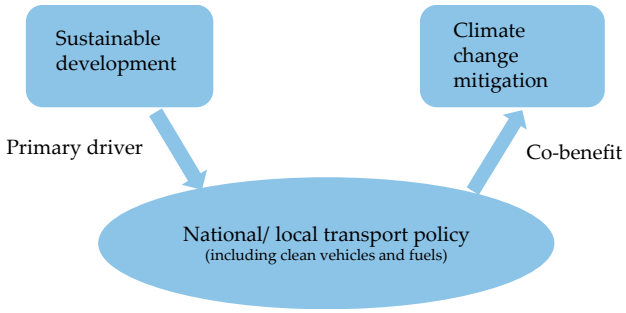

Figure 1. Sustainable development and low-carbon transport (source: authors, based on [8]).

LCT can be defined as transport sector developments that emit less GHG emissions than in a business-as-usual (BAU) scenario. LCT interventions are those that contribute to climate change mitigation no matter what the primary policy goals are. This framing is consistent with 'low-carbon development' in which national and local development objectives are the starting point, and opportunities are identified to achieve these in a manner which emits the least GHG emissions [9].

Under the United Nations Framework Convention on Climate Change (UNFCCC), countries are required to report national climate change strategies in the form of nationally determined contributions (climate action plans) (NDCs), national communications (NCs) and biennial update reports (BURs) [2]. These strategies could be seen as reflecting a 'top-down' view of climate change mitigation at the national level driven by international agendas. However, climate policy objectives need to be implemented in each sector at the national and local level in the form of policies and measures related to transport development, vehicles and energy systems.

Reaching long-term climate targets requires short-, medium- and long-term actions which are described in recent literature, a synthesis of which can be found in [1], which also shows the benefits for sustainable development objectives. More detailed global climate change mitigation scenarios for the transport sector are described in [3,10]. Key measures include fuel efficiency improvements for passenger and freight vehicles; renewable energy in transport; electrification of passenger cars, motorcycles, three-wheelers, buses and trucks; as well as transport demand management, logistics efficiency and shifting from private vehicles to more efficient modes.

Global progress on these measures is mixed and falls short of what is required for a well-below-2-degrees scenario, as shown in the Transport and Climate Change Global Status Report (TCC-GSR) [4]. For example, while fuel economy of new cars is improving globally, city-level sustainable mobility planning is becoming more common, more cities are implementing low-emission zones, and the stock of electric two-wheelers is increasing rapidly (mainly in China and Europe), there remains limited progress on electrifying cars and trucks [11], implementing more efficient road

freight and logistics measures [12], realising envisioned shifts to more efficient transport modes, and increasing the share of renewables in the transport sector [4].

While there is a substantial body of literature on LCT at the global level and for developed countries, existing research on developing country mitigation pathways for transport is more limited and general. Figueroa et al. [13], for example, highlight the key role of informal transport and land-use planning, and Dhar et al. [14] link transport policies in India to the NDC. However, a research gap exists as to which solutions exist for LICs that can be implemented quickly, have GHG mitigation potential, and can contribute to climate strategies. Quick wins (QWs) are low-carbon transport policies and measures that can be implemented in the short to medium term, are relatively low-cost, and have high sustainable development benefits. This paper therefore aims to address the following research questions:

- What are the most suitable low-carbon transport QWs for LICs?
- Which QWs are priorities for stakeholders in LICs?
- What is the current status of implementation of QWs?
- To what extent are QWs integrated in national climate change strategies?

The research method and data sources used in the study are outlined in Section 2. This is followed by a discussion of the climate mitigation potential of QWs and how they are integrated in climate strategies (Section 3), i.e., the top-down perspective. A bottom-up analysis is undertaken of QWs in nine focus countries: six in Africa and three in Asia (Section 4), followed by a discussion of the results, main conclusions and recommendations.

2. Materials and Methods

The research method and data sources are summarised in the flow diagram in Figure 2 and described below. The corresponding sections are indicated in brackets.

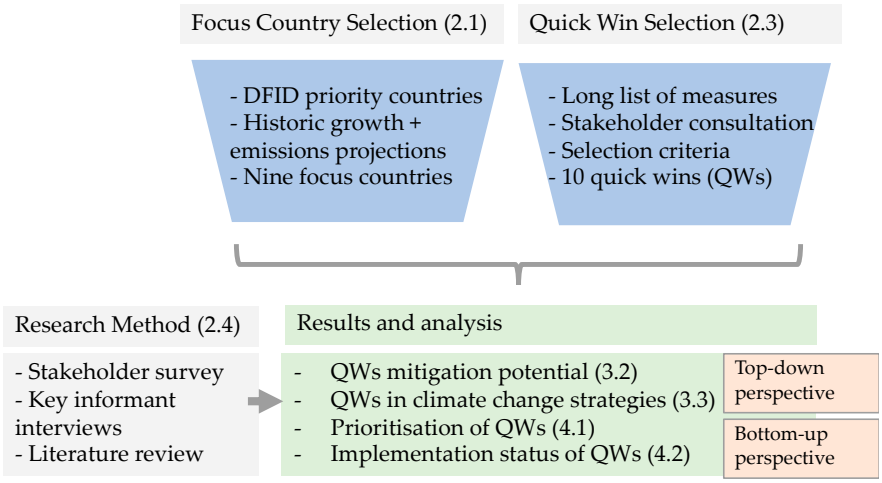

Figure 2. Study method (with section numbers).

2.1. Country Selection Criteria

The study focused on the UK Department of International Development's (DFID) priority countries in Africa and Asia: Bangladesh, Ghana, India, Indonesia, Kenya, Nigeria, Rwanda, South Africa, and Uganda. These nine countries were selected through a robust, quantitative process based on their need for low-carbon transport interventions. This was assessed using the following criteria: motorisation rates, transport emissions currently, and projected BAU transport emissions growth in the future.

2.2. Low-Carbon Transport Quick Wins Definition

Transport QWs are defined here as actions which can be taken in the short to medium term and contribute to the low carbon transformation of transport (i.e., a well below 2 degrees or even 1.5-degree scenario). They provide different benefits (e.g., access, efficiency, safety and environment benefits) to local and national stakeholders and are main policy drivers with climate change mitigation as a co-benefit. QWs have been tested at scale and are replicable with the possibility for large-scale impact. They are technically and economically feasible in both developed and developing countries using available technologies. Finally, QWs address both passenger and freight transport and should be relevant to the Avoid-Shift-Improve (ASI) concept [15]. This is a sustainable transport policy framework that emphasises avoiding and reducing trips (A), shifting to environmentally-friendly modes of transport (S), and improving (I) vehicle energy and carbon efficiency of each mode [16].

2.3. Selection of Transport Quick Wins for LICs

From March to July 2016, a six-step process (see [15]) was undertaken to develop a list of QWs. An email invitation was sent to more than 100 international organisations working on sustainable transport and resulted in the compilation of a long list of over 100 measures. Through grouping and balancing measures across themes, modes and world regions, the list was reduced to approximately 40 options. These measures were further evaluated against sustainable development benefits, implementation barriers and coverage of 'Avoid-Shift-Improve' measures, and both passenger and freight transport. Expert feedback was received on the remaining 23 measures while an on-line survey of more than 100 stakeholders provided feedback on the definition and feasibility of the QWs. Finally, a more detailed assessment against the following criteria provided a final list of 10 QWs specifically for the purpose and context of the analysis:

- Sustainable development benefits, such as air quality and improved accessibility;
- Applicability in DFID priority countries that reflect policy needs of the local transport system context;
- Climate change mitigation potential; and
- Passenger and freight including avoid-shift-improve options.

The final 10 QWs for this analysis are:

1. Accelerate phase-out of fossil fuel subsidies;
2. Formulate Sustainable Urban Mobility Plans (SUMPs) in primary and secondary cities, supported by a National Urban Mobility Policy or programme;
3. Promote electric two- and three wheelers, including e-vehicle sharing systems in primary and secondary cities as well as rural areas, for both passenger mobility as well as last-mile urban freight;
4. Limit import of inefficient and polluting secondhand trucks;
5. Implement (ultra-) low emission zones, including car-free zones in city centres;
6. Introduce and scale up pricing for car-related travel options (e.g., congestion/road charging, parking pricing, workplace parking levy) in primary and secondary cities;
7. Tighten fuel economy standards for passenger cars, coupled with labelling schemes and fiscal incentives such as carbon dioxide (CO_2) based vehicle taxation;
8. Provide and improve walking and cycling infrastructure (e.g., connected walking paths, protected cycle lanes, safe intersections), reallocating road space where necessary;
9. Improve freight efficiency (e.g., reduce empty load running by freight trucks) through route optimisation, asset sharing between companies, and increased use of information and communication technology (ICT) solutions;
10. Accelerate deployment of tighter diesel fuel quality standards to reduce emissions of black carbon (BC) and other short-lived climate pollutants.

2.4. Method for Quick Wins Assessment

Primary data for the QW assessment were collected from interviews and a questionnaire survey. From October to December 2018, semi-structured key informant interviews were undertaken with 23 experts from the nine countries (2–3 per country). Experts were from national and local transport government agencies, research institutions and implementing agencies. Among other questions, they were asked to rate each QW option on a scale from 1 to 5 on their appropriateness in the short to medium term for their country. Respondents were also able to suggest additional QWs.

From September to October 2018, a survey of low carbon, high volume transport knowledge and capacity in Africa and South Asia was undertaken of the stakeholder network of the Partnership for Sustainable, Low-carbon Transport. The online tool SurveyMonkey was used. The survey included qualitative and quantitative questions exploring how LCT knowledge is gained, how capacity is achieved, and how transport users and other affected parties are engaged. As part of one question in the survey, respondents were requested to rank the 10 QWs from 1 to 10 according to their appropriateness for the respondent's country. The survey was sent to 816 experts and received 67 respondents with 49 completing the question on QWs. The 67 respondents were equally represented across government agencies, private sector, research institutions and implementing agencies. However, most of the respondents were from African countries.

Secondary data on QWs implementation, integration in climate plans and mitigation potential was collected from existing peer-reviewed and grey literature as well as technical reports, government plans and reports, and additional sources such as online media. See below for further details on this data collection process. The findings from the literature review were validated and elaborated by stakeholder interviews.

3. Results and Analysis Part 1: A Top-Down Climate Change Perspective on Transport Quick Wins

This section briefly discusses general literature on low-carbon transport in the nine focus countries and then looks at the mitigation potential of quick wins and to what extent these are present in climate strategies in the focus countries.

3.1. Mitigation Potential of Quick Wins

Literature on transport and climate change mitigation exists for some of the focus countries, including economy-wide and transport sector-specific low-carbon scenarios. Gota et al. [5] compiled a comprehensive global database of mitigation studies and reports for 81 countries including six out of the nine countries. Transport was one of the sectors included in those economy-wide mitigation potential modelling studies; as these are based on energy-economy models, the level of detail is limited. These studies show that the reduction potential (averaged across multiple studies for one country) below BAU for the transport sector in 2050 is 62% for Bangladesh, 65% for India, 61% for Indonesia, 82% for Nigeria and 61% for South Africa, while for Kenya the potential is 37% for 2030.

Transport sector-specific literature shows more detail on the mitigation potential of quick wins. Among other low-carbon options, these show the importance of some of the quick wins as well. In India, Dhar et al. [17] modelled low-carbon scenarios for transport for a 1.5 degree scenario, with vehicle fuel efficiency, transport demand management (in passenger and freight), biofuels, modal shift (in passenger and freight), and electric vehicles (including two-wheelers) playing a key role. For Bangladesh, Gota & Anthapur [18] developed low-carbon freight scenarios, also estimating black carbon emissions, that consider broad Avoid, Shift and Improve strategies. Siagian et al. [19] modelled an economy-wide scenario for Indonesia, in which energy efficiency and biofuel use in transport can help in achieving NDC targets. In Kenya, e-scooters and vehicle efficiency for cars and trucks are included in the transport sector low-carbon scenarios [20]. Finally, Stone et al. [21] developed a detailed model to estimate historical fuel demand for road freight and passenger vehicles in South Africa. In short, there is sector-wide low-carbon transport literature for a few of the nine countries; however, the scenarios

include few short-term policy options and limited detail on these options, and the freight sector in particular is covered only to a limited extent.

3.2. Mitigation Potential of Quick Wins

A literature review was undertaken on the climate mitigation potential of the 10 QWs including global studies as well as research on the nine focus countries. The main methodology was a keyword search in Scopus and Google Scholar. Keywords included the 10 QWs, as well as "low-carbon transport", in combination with the names of the nine countries. In addition, relevant references from these articles were used. This resulted in 24 peer-reviewed articles, of which 14 cover climate change potential and 10 are indirectly relevant. In addition, 17 grey literature sources such as technical reports from international organisations were found by searching in Google using similar keywords. Literature was from the past five years (2013–2018) with a few sources from before this period if more recent sources were unavailable.

Table 1 summarises literature on transport sector GHG mitigation and shows the importance and potential of all 10 QWs in the nine selected countries.

For India, most mitigation options are included in low-carbon scenarios or studies for specific measures. For Indonesia, several studies are available as well. For Bangladesh and the six African countries, literature is limited, except for options related to fuel efficiency and fuel standards, where international organisations have done extensive analysis (even if not specifically on GHG mitigation potential). For some specific options (e.g., limiting imports of used trucks and introducing low emission zones) more analysis would be beneficial.

Table 1. Mitigation potential literature for 10 LCT (low-carbon transport) quick wins.

	Quick Win	Key Points from Mitigation Potential Literature (Global)	Mitigation Literature Country-Specific
1.	Fossil fuel subsidy phase out	Removal of fossil fuel consumption subsidies could lead to global GHG emission reductions of 2–4% by 2020, rising to 8–12% by 2050 [22]. Removal of fossil fuel subsidies is a prerequisite to carbon taxation, which is required to achieve a beyond 2-degree scenario [3].	For India and Indonesia, fuel subsidy reform could lead to between 1 and 9% GHG savings in 2030 [23]. For Ghana, removal of subsidies could result in negative impact on household welfare [24]. Phasing out energy subsidies could reduce Indonesian CO_2 emissions from fuel combustion by 11–13% in 2020 [25]
2.	Sustainable Urban Mobility Plans, National Urban Mobility Programme	Urban passenger transport emits about 25% of total transport sector emissions. SUMPs mainly focus on non-technology options, i.e., 'avoid' and 'shift', which contribute 2–40% of emission reductions in the 2050 low-carbon scenario [10]. Implementation of a SUMP in Burgos (Spain) resulted in 17% lower CO_2 emissions [26]. Pisoni et al. model impact of SUMPs on air quality [27].	For the 1.5-degree scenario in India, demand-side urban transport measures are essential [17], and CO_2 emissions is one of the key indicators in comprehensive mobility plans in India [28]. Urban transport measures in 7 Indonesian cities, supported by a national urban transport framework, can save 0.1–0.2 tCO_2 per capita in 2030 [29]
3.	Electric two- and three-wheelers	Over 80% of the 29 Mt CO_2 savings in 2017 by all types of EVs globally are due to e-bikes in China [11]. Full decarbonisation of two- and three-wheelers is necessary for the beyond 2 degrees scenario [3]. For Vietnam, e-bikes are the mitigation option with the second-largest potential in the transport sector [30]. In Thailand, deploying electric motorcycles could reduce two-wheeler life cycle CO_2-eq emissions by 42–46% [31].	For a 2-degree scenario in India, over 90% of two-wheelers should be electric [14]; however, energy-use of two- and three-wheelers varies depending on driving conditions [32]. There are cost and CO_2 emission savings for electric tricycles in Nigeria [33]. A study shows benefits of electric two-wheelers for Africa (no CO_2 estimates) [34] Benefits are shown for ojek (motorcycle taxi) drivers by switching to electric vehicles in Indonesia [35]. There is a rapidly expanding market in Africa for motorcycles and boda boda (motorcycle taxis) in particular [36].
4.	Limit import of inefficient and polluting secondhand trucks	Import restrictions for secondhand vehicles as a key part of the policy package in a global low-sulphur scenario [37]. Fuel efficiency of vehicles declines rapidly after 15 years of use, up to 50% by 25 years [38].	Import policies are considered in the fuel efficiency scenario in a green freight study for Bangladesh [18]. A low-carbon scenario for Kigali (Rwanda) considers vehicle age restrictions [39].

Table 1. *Cont.*

	Quick Win	Key Points from Mitigation Potential Literature (Global)	Mitigation Literature Country-Specific
5.	Low-emission zones	Impact assessments show some impact of environmental zones in EU cities on the impact on PM/soot emissions [40]. Further climate benefits would accrue from more EV deployment; however, no study has been found estimating the GHG impact.	No sources found.
6.	Pricing of car use	There is a relatively strong knowledge base of ex-post and ex-ante studies on road pricing and parking management [41,42]. In Singapore, a package of measures including congestion charging and CO_2-based vehicle taxation results in low transport emissions per capita [1].	Study on congestion pricing in Delhi shows significant shift from private vehicles to public transport [43].
7.	Fuel economy standards and incentives	Regulation on the energy-use and lifecycle GHG emissions of vehicles is necessary for a beyond 2 degrees scenario [3] and progress is seen in many countries [44]. The IPCC presents emission intensity reduction potentials for different types of diesel and petrol vehicles [45].	Progress in fuel economy policies in major markets, including India, Indonesia and South Africa is reviewed [44]. Fuel efficiency strategies are included in low-carbon transport scenario for India [14].
8.	Non-motorised transport (NMT) infrastructure	Globally, it is estimated that in 2050, 22% of urban passenger travel can be by (e)bike, compared to 6% in the base case. This results in 300 $MtCO_2$ reductions in 2050 and USD 1 trillion in savings from vehicle purchase and operation and construction and maintenance of infrastructure [46]. For walking, no specific mitigation potential estimates have been found; however, it is acknowledged for its key role in mitigation [45] and reaching public transport modal shift targets.	Sustainable urban transport scenario for Bangalore includes NMT and transit-oriented development (TOD) and CO_2 estimates [47]. Low-carbon scenario for Kigali (Rwanda) quantifies CO_2 savings from bike lane investments [39]. In Ghana, three out of four would not cycle to social events for public image; health is driver [48]. Research on walking and cycling in African cities, including in Kenya and South-Africa [49].
9.	Logistics optimization/ freight efficiency	The IEA [12] analyses 15 measures, e.g., urban consolidation centres, platooning, co-modality, backhauling, retiming of deliveries, etc. Most of these could have a best-case impact of up to about 5% emission reductions, while some measures may have a reduction potential over 10%. Implementation of these measures, including in developed countries, is still in an early stage.	A study CO_2 scenario with freight efficiency for Bangladesh [18]. A report highlights many measures (no mitigation potential calculation) and note that logistics is 7% of India's total CO_2 emissions and 67% of transport PM [50]. Green freight programme for Northern Corridor (including Rwanda, Kenya) with measures, in context of mitigation and air pollution (objective of 10% reduction in CO_2 per ton-km) [51].
10.	Diesel quality standards	A mitigation scenario for black carbon (BC) reduces such emissions by about half, corresponding to about 4 $GtCO_2$-eq (GWP100) in 2050 [52]. Diesel road vehicles and ships are one of the main sources of BC emissions with 19% of global BC emissions [53]. Research shows that a global sulphur scenario reduces BC emission from diesel road transport by about 90% from the baseline in 2040 [37]. Such strategies will result substantial health benefits from reduced exposure to air pollution.	Report includes country level market analysis for low-sulphur diesel for Bangladesh, Ghana, India, Indonesia, Kenya, Nigeria, Rwanda, South Africa, and Uganda [54]. Diesel vehicles contribute 20–55% of total BC in South Asian cities [55].

3.3. Integration of Quick Wins in Climate Change Strategies

To assess how QWs are integrated in climate change strategies of the nine countries, an analysis of the Paris Agreement reporting mechanisms (NDCs, BURs and NCs) (a methodology used by for example Stead [56]) and other strategies, such as climate change strategies (CCSs), climate change action plan (CCAP), low-carbon development strategy (LCDS) and National Climate Change Policy (NCCP) was undertaken. In Table 2, 'Y' means the QW is in at least one of the plans/reports. In most cases a QW is not included in all of these. One reason for this is that NDCs are often short whereas BURs and NCs present measures in more detail. In addition, it should be noted that all countries have submitted an NDC and at least one NC, whereas five have submitted one or multiple BURs, and five have additional national strategies.

Table 2. Quick wins in climate change strategies and reports.

	Country	Bangladesh	Ghana	India	Indonesia	Kenya	Nigeria	Rwanda	South Africa	Uganda
	Reports Analysed	**NDC, NC2 (2012)**	**NDC, BUR2, NC3, CC policy**	**NDC, NC2, BUR1, LCS**	**NDC, NC3, BUR**	**NDC, NC, CCAP 2013**	**NDC, NC2, BUR1**	**NDC, NC2, LDCS 2011**	**NDC, NC3, BUR2**	**NDC, NC2, NCCP 2015**
1.	Phase-out fossil fuel subsidies		Y	Y			Y			
2.	SUMPs and NUMP									
3.	Promote electric two- and three-wheelers			Y						
4.	Limit import of 2nd hand trucks		Y					Y		Y
5.	Low emission zone (LEZ)									
6.	Pricing for car-related travel			Y	Y		Y			
7.	Fuel economy policies	Y		Y	Y		Y	Y	Y	Y
8.	NMT infrastructure		Y	Y	Y			Y	Y	Y
9.	Freight efficiency/logistics									
10.	Diesel quality standards		Y	Y				Y		Y

NDC: nationally determined contribution; NC: national communication; BUR: biennial update report; LC(D)S: low-carbon (development) strategy; CC: climate change; NCCP: national climate change policy.

Fuel economy policies and non-motorised transport (NMT) infrastructure are the QWs that are included most often: six or more countries do so. Fossil fuel subsidy reduction, import restrictions, pricing measures, and diesel quality standards are included by 3–5 countries. SUMP, electric two- and three-wheelers, low emission zone (LEZ) and freight efficiency by zero or one country.

4. Results and Analysis Part 2: A Bottom-Up Transport Perspective on Quick Wins for Focus Countries

4.1. Perceived Feasibility of Quick Wins for Focus Countries

Figure 3 shows perceived feasibility of transport QWs according to the survey responses. Respondents regarded the following QWs as most feasible in their countries (noting that data are not sufficient to suggest a proposed ranking of these QWs on a country or regional basis):

- QW 2 Formulate Sustainable Urban Mobility Plans (SUMPs) in primary and secondary cities, supported by a National Urban Mobility Policy or programme.
- QW 8 Provide and improve walking and cycling infrastructure (e.g., connected walking paths, protected bicycle lanes), reallocating road space where necessary.
- QW 3 Limit imports of inefficient and polluting secondhand trucks, complemented by age limitations for the existing fleet.
- QW 4 Promote electric two- and three-wheelers (including shared e-vehicles) in primary and secondary cities.
- QW 1 Accelerate phase-out of fossil fuel subsidies.

Other key options from respondents include diesel quality standards, increasing freight efficiency, and paratransit reform and regulation. The paratransit reform and regulation option refers to changing from unregulated mini-buses and three-wheelers to a system where routes are organised by a regulator, potentially in support of high-quality public transport such as metro or bus rapid transport (BRT). Several respondents suggested this as an option to be added to the 10 QWs.

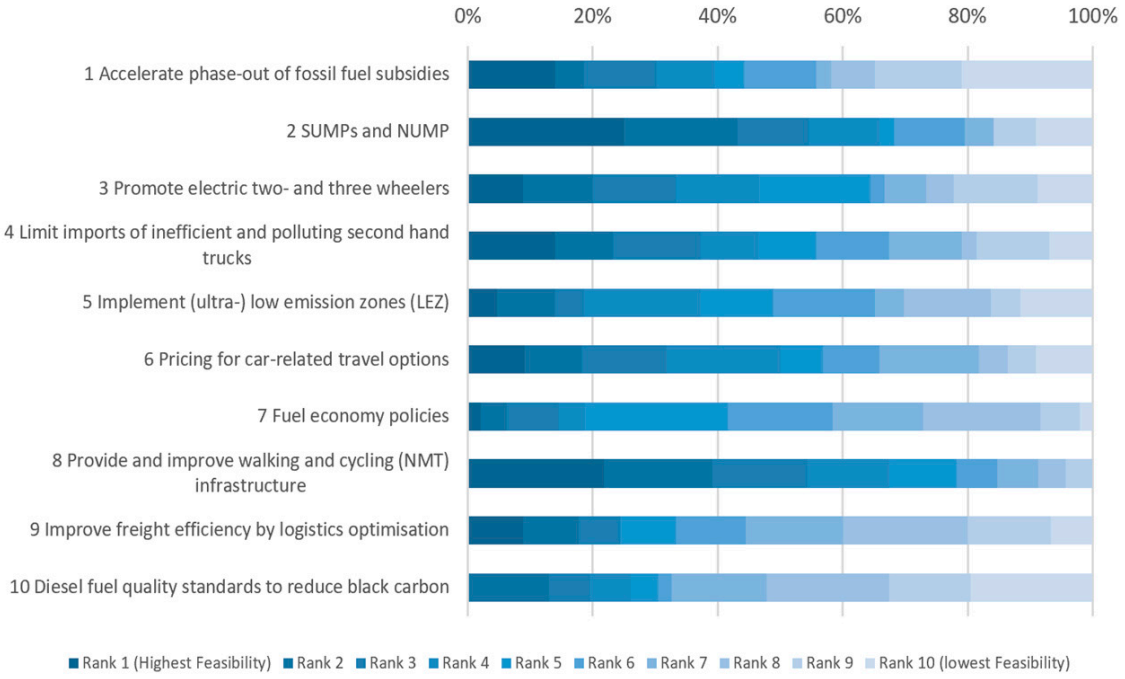

Figure 3. Perceived feasibility of the low-carbon transport quick wins.

4.2. Implementation Progress of QWs

A review of planning and implementation of the QWs in the nine selected countries was also undertaken. The analysis was based mainly on peer-reviewed and grey literature from 2017–2018 which included reports and policy briefs, government official documents, and if no other sources available, news articles from online media. All sources are included in a matrix (see Supplementary Materials S2) with Table 3 presenting the summary assessment.

Methodology for the rating of the implementation status:

0 No implementation or discussion of the options in the policy domain
* Measure in discussion or pilot implementation
** Policy partial in place or planned, or partial implementation
*** Full-scale implementation

Three researchers independently rated implementation based on the same literature.

The detailed application of this methodology varies depending on the nature of each QW. For example, evaluation of regulatory measures such as diesel quality standards or limiting imports of used trucks import are more straightforward than more diverse measures such as improving freight efficiency or NMT infrastructure, which require a multitude of smaller interventions (see S2 Matrix on quick win implementation in Supplementary Materials).

Table 3. Assessment of quick win implementation status in focus countries.

	Country	Bangladesh	Ghana	India	Indonesia	Kenya	Nigeria	Rwanda	South Africa	Uganda
1.	Phase-out fossil fuel subsidies	**	**	***	**	***	*	**	*	*
2.	SUMPs and NUMP	**	*	**	**	**	0	*	**	*
3.	Promote electric two- and three-wheelers	**	*	***	*	**	*	**	**	**
4.	Limit import of 2nd hand trucks	*	*	***	***	**	**	**	***	*
5.	Low-emission zones	0	0	0	0	0	0	0	0	0
6.	Pricing for car-related travel	*	0	**	**	*	**	*	**	*
7.	Fuel economy policies	*	*	***	**	*	*	*	**	*
8.	NMT infrastructure	*	**	**	**	**	**	**	**	**
9.	Freight efficiency/logistics	*	*	**	**	*	*	*	**	*
10.	Diesel quality standards	**	**	***	**	***	**	***	**	***

There is progress across most or all nine countries for QW 4 (Limiting imports of used trucks) and QW 10 (Diesel quality standards). This could indicate an increased awareness of air pollution issues with both these options playing a key role in addressing diesel emissions. In addition, a number of international organisations are also promoting these actions (e.g., the International Council on Clean Transportation and UN Environment).

Options where progress varies among the nine countries are the following:

- QW 1 (Fossil fuel subsidy reduction): this is a politically challenging option, where public opposition to policy changes can be expected [22];
- QW 2 (SUMPs and NUMP): India and South Africa have a nationally-guided programme for cities, while in other countries only a few cities develop SUMP-like mobility plans. Awareness of SUMPs and NUMPs as a key policy tool is picking up in recent years. NUMPs are challenging especially because the national government is often reluctant to allocate financial resources to cities, with the local governments in turn not seeing the benefit of planning guidelines from a higher-level authority;
- QW 3 (Promoting electric two and three wheelers): two-wheelers are not popular with policymakers [57], who see motorcycle drivers as reckless and often involved in traffic crashes, rather than a flexible, fast and space and energy-efficient mode of transport. However, electrification is increasingly acknowledged as part of air quality and energy security strategies;
- QW7 (Fuel economy policies) with for example India adopting relatively ambitious standards. Although fuel economy policies are beneficial to the national economy, implementing these could be politically challenging due to potential impacts on the car market and manufacturers;

- QW 8 (NMT infrastructure): many cities are examining this option and consider it important, yet implementation is limited, with unsafe and inconvenient conditions for walking and cycling. Allocation of government budget to the various transport modes is a key issue, with for example the political economy in Ghana favouring road investments over NMT and rail [58].

There is little progress on the following options: QW 5 (Low-emission zones), which is not discussed in any project country yet with no clear examples in other LICs and MICs; QW 6 (Pricing for car-related travel) is being considered and discussed but with little implementation; and QW 9 (Freight efficiency improvements) with progress limited to isolated projects in some countries. This may be due to governments considering freight as the domain of the private sector and the complexity of such projects and plans.

Tables 2 and 3 show that more QW policy activity is taking place than reported in climate plans. Table 2 shows that diesel quality standards and import restrictions are included in only a few climate strategies. In addition, electric two- and three-wheelers are missing in climate plans, even though there has been policy progress in recent years, for example in India's electric vehicle support scheme FAME [59]. To some extent the same is true for SUMPs and freight efficiency measures. On the other hand, car-related pricing measures are mentioned in climate plans but with limited progress in policy development.

Although the reasons for these reported differences are beyond the scope of this paper, possible explanations could be that for some measures (e.g., vehicle import restrictions, diesel quality standards and SUMPs) the climate benefits, which are partially based on the warming potential of black carbon, are not explicitly recognised. It may also be that in climate plans, urban passenger transport and alternative fuels are better represented than freight and two- and three-wheelers [60].

It may also be noted that climate change reports are often from 2016 or earlier, whereas recent literature from 2017 and 2018 was used in Table 1. Electric two- and three-wheelers and SUMPs may have only recently received more attention and are therefore better reflected after 2017.

In summary, from an examination of the QW mitigation potential, QW in climate plans (top-down perspective, Section 3), QW implementation status, and QW perceived feasibility (bottom-up perspective, Section 4), the following observations can be drawn:

- Freight efficiency measures appear to be less prioritised in literature, climate strategies, policy implementation and by stakeholders.
- Fuel efficiency policies are acknowledged as key in literature, but lack in implementation and priority by stakeholders.
- SUMPs and NUMPs, as well as NMT infrastructure, are seen as a key option but implementation is lagging behind.
- Attention by stakeholders and literature coverage for electric two- and three-wheelers is increasing, especially in recent years in Asian and African countries.
- Improving diesel quality standards is considered important in literature and by stakeholders from a local air pollution and health perspective, with substantial co-benefits due to the climate warming potential of black carbon.
- Little attention is given to LEZs in the climate change context, even though these may play a key role in promoting electric vehicles [61].

It should also be noted that some of the highly rated QWs are measures that are typical for LICs and MICs and are often less relevant for HICs, for example diesel quality standards, truck import limitations, electric two- and three-wheelers, and paratransit reform.

5. Discussion

5.1. Interpretation of Results and Limitations of Data and Method

The results presented here can be considered fairly robust. Nevertheless, the following caveats are noted. In the primary data collection (online questionnaire survey and interviews), nearly all of the respondents are from the transport sector. They may have knowledge about energy and environmental issues, yet their perspective and priorities may differ from experts that are primarily from the energy, industry and environmental sectors. This may impact the QW prioritisation outcome to some extent. In addition, most of the survey and interview respondents are from Africa.

The literature review covered a range of sources from peer-reviewed literature, grey literature, government reports and media articles, mostly from the last two years and nearly all more recent than 2012. It covered all focus countries and QWs. Although non-exhaustive, it provides an up-to-date picture of the literature on QW implementation and mitigation potential in the nine countries. The scoring of the implementation status involved a certain degree of subjectivity, both from a methodological perspective in assessing level of policy development and scope. For example, a large country such as India is not comparable to a small country like Ghana when it comes to implementation of NMT at the local level. Finally, the mentioning of a policy measure in climate plans does not necessarily mean it will be implemented and in what way (i.e., scope and level of ambition).

5.2. Climate Change Strategy Development Process and Quick Wins

Climate policy is still a relatively new phenomenon. Since the adoption of the Paris Agreement in 2015 it is higher on the political agenda, and developing countries realise that the climate change policy framework is here to stay. The Paris Agreement climate reporting mechanisms (NDC/BUR/NC) have resulted in developing countries thinking about aspects of low-carbon transport, as shown in [8] for Southeast-Asian countries.

LCT strategies require actions from a variety of government agencies. Transport-related agencies such as national or local transport or planning bodies develop and implement Avoid and Shift interventions while Improve measures related to vehicles are often in the mandate of other agencies such as national ministries of environment, energy, finance and industry [62]. Some options may involve all these stakeholders. Therefore, to develop a comprehensive climate strategy for the transport sector, collaboration and coordination between these various agencies is required. The NDC process has been shown to help inter-ministerial coordination for LCT in some Southeast-Asian countries, including in Indonesia [8]. However, various agencies may have different and sometimes conflicting objectives, for example, producing cars and reducing congestion, as was raised by an Indonesian respondent.

QWs may be an opportunity to improve integration of transport in climate change plans. However, more actions are being developed and taken than currently included in climate change plans. These can be discussed in future inter-ministerial processes for LCT strategies. In this way, QWs can act as an important bridge between the top-down and bottom-up perspectives on LCT, as described in Sections 3 and 4 above (Figure 4).

To further promote development of QWs as well as their integration with climate strategies, more information and analysis about how to implement these is required. This also requires more information about the mitigation potential of QWs for each local context, as well as distributional effects on various social groups and sustainable development benefits. International organisations such as the International Energy Agency, UN Environment and multilateral development banks also have a role to play as various global or regional initiatives are supporting QWs, in particular diesel quality standards, fuel economy policy, SUMPs/NUMP, NMT, electric vehicles (though not focusing specifically on two- and three-wheelers) and green freight [15]. Examples of such initiatives include the Global Fuel Economy Initiative, Mobilise Your City, Global Green Freight Action Plan and the Electric Vehicles Initiative.

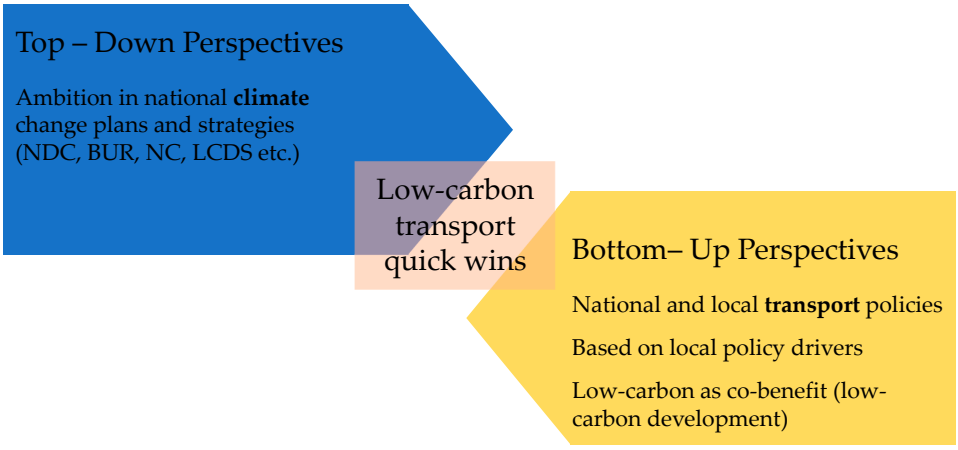

Figure 4. Quick wins can connect top-down climate and bottom-up transport perspectives on low-carbon transport. (Source: authors).

5.3. Broader Context of Long-Term Decarbonisation

QWs have a key role to play in climate change mitigation; however, they are only part of the package of measures that is required to bring the transport sector onto a 1.5-degree pathway. Moreover, QWs do not substitute large-scale investments in low-carbon infrastructure (e.g., rail, waterways, and electric vehicle charging) infrastructure and vehicles that have to be taken in the short to medium term in order to avoid a long-term lock-in into high-carbon transport systems. Given the long lead time of planning required for such infrastructure to be operational, decision-making processes require a focus on low-carbon infrastructure investment.

6. Conclusions

For transport policy makers in LICs, climate change mitigation is generally not a high priority. Therefore, GHG reduction can be seen as a co-benefit of sustainable mobility. LCT interventions are those that are implemented to improve access, reduce congestion, increase equity, improve air quality and energy security, yet that also contribute to climate change mitigation. In this way, the transport sector can contribute to achieving climate objectives stipulated in the NDCs.

LCT QWs are interventions with high sustainable development benefits and can be implemented in the short-term. They can be seen as a bottom-up approach to integrate sustainable mobility options in climate change strategies, or in other words, can operationalise low-carbon development in the transport sector. This paper presents 10 such QWs. As the climate change mitigation potential of these is significant, they can play an important role in short-term decarbonisation of the transport sector and help to achieve long-term targets required under the Paris Agreement.

Analysis of nine LICs in Africa and Asia shows that fuel economy policies and NMT infrastructure are the QWs that are included most often in climate change strategies: six or more countries do so. Fossil fuel subsidy reduction, secondhand vehicle import restrictions, pricing measures, and diesel quality standards are included by 3–5 countries. SUMPs, electric two and three-wheelers, LEZ and freight efficiency by zero or one country. However, when investigating policy development in the nine countries, it appears more is happening than the climate change reports are showing. For example, most countries are pursuing diesel quality standards, import restriction, and, to a lesser extent, promotion of electric two- and three-wheelers, even though the climate reports do not show this. It should also be noted that these three options together with, for example, paratransit reform, are measures that are typical for LICs and MICs and are less relevant for high-income countries. In addition to these options, stakeholders in the nine countries prioritised SUMPs, NMT infrastructure, and fossil fuel subsidy reduction. However, low-carbon freight options are emphasised less by

stakeholders, literature, and current policy development, yet freight is responsible for 36% of carbon dioxide emissions from the land transport [12].

Based on the analysis of LCT QWs for LICs, the following recommendations can be made. Firstly, more country-level analysis on the various costs and benefits, including distributional impacts, mitigation potential and sustainable development impacts of QWs, would be beneficial in enhancing the knowledge base and awareness. Secondly, each QW requires a detailed analysis of design options to implement the measure, specific for each local or national context. Finally, improved coordination and collaboration between transport authorities (mainly Avoid and Shift measures) and agencies focusing on energy, industrial and environmental aspects of vehicles (mainly Improve measures) is key in bridging the top-down and bottom-up gap and achieving low carbon transport in LICs in Asia and Africa.

This paper contributes to a growing body of literature that connects transport and climate policy. It particularly increases the understanding of how transport-related policies and measures can support climate strategies in LICs while also contributing to sustainable development.

Supplementary Materials: The following materials are available online at http://www.mdpi.com/2071-1050/11/16/4369/s1, Matrix on low-carbon transport measures in climate plans, and http://www.mdpi.com/2071-1050/11/16/4369/s2, Quick wins implementation status matrix.

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